BEFORE
THE PUBLIC SERVICE COMMISSION OF
SOUTH CAROLINA

DOCKET NO. 2019-290-WS

In the Matter of:	)	
	)	**REBUTTAL TESTIMONY OF**
Application of Blue Granite Water	)	**JOHN SPANOS FOR**
Company for Approval to Adjust	)	**BLUE GRANITE WATER COMPANY**
Rate Schedules and Increase Rates	)	
	)	

TABLE OF CONTENTS

I. INTRODUCTION

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is John J. Spanos and my business address is 207 Senate Avenue, Camp Hill, Pennsylvania 17011.

Q. ARE YOU THE SAME JOHN J. SPANOS WHO PREVIOUSLY FILED DIRECT TESTIMONY IN THIS CASE?

A. Yes.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS PROCEEDING?

A. I am testifying on behalf of Blue Granite Water Company ("BGWC" or the "Company").

Q. WHAT IS THE PURPOSE OF YOUR REBUTTAL TESTIMONY?

A. My rebuttal testimony responds to the depreciation-related testimony of David J. Garrett on behalf of the South Carolina Office of Regulatory Staff. The issues discussed are the mass property service life proposals and net salvage estimates.

Q. PLEASE SUMMARIZE YOUR REBUTTAL TESTIMONY.

A. ORS witness Garrett is proposing a fairly significant change in depreciation expense compared to the Company's depreciation studies, due in large part to the changes to service lives he is proposing. Another factor contributing to the decreased expense proposed by Mr. Garrett is that he changes the Company recommended net salvage percentages. Mr. Garrett proposes to reduce the depreciation expense established in the depreciation study for water plant by $362,678 and in the wastewater plant by $397,558. This is a total decrease of $760,236 from what was proposed by BGWC. A large amount of this reduction is due to Mr. Garrett proposing longer service lives for both water and wastewater plant

accounts. His proposed service life estimates are determined using life analysis that is objectively based solely on mathematical best fit curves without making appropriate determinations and judgments as to which data points should be emphasized. He utilizes only an objective approach to life analysis, when I will explain below, referencing authoritative depreciation texts, that there must also be a subjective component to life analysis, utilizing expert judgment. Regarding Mr. Garrett's net salvage estimates for this case, and his claim that the company proposed estimates are excessive, he supported as negative or more negative net salvage estimates in a recent case for a majority of the accounts for which he is proposing net salvage changes in this case.

Q. MR. GARRETT CONTINUALLY REFERS TO THE DEPRECIATION RATES PROPOSED IN THE DEPRECIATION STUDY AS EXCESSIVE. ARE THE DEPRECIATION RATES YOU PROPOSED EXCESSIVE?

A. No. The depreciation rates proposed in the depreciation study are not excessive. For example, the net salvage estimates I have proposed are, generally, less negative than those used by most water companies. Additionally, the depreciation rates were developed using a consistent, systematic and rational approach to estimating both service lives and net salvage. Mr. Garrett's approach to selecting survivor curves is inconsistent and appears to be results-based. For example, pages 13 and 14 of Appendix C from his testimony discuss the need for visual curve fitting in addition to the mathematical approach. He provides this quote from a highly regarded depreciation text written by Wolf and Fitch: "The results of mathematical curve fitting serve as a guide for the analyst and speed the visual fitting process. But the results of the mathematical fitting should be checked visually, and the

final determination of the best fit be made by the analyst."[1] However, for a majority of the accounts for which Mr. Garrett proposes a different survivor curve, his reasons are purely based on a mathematical approach and he does not consider visual curve fitting in his recommendation.

In addition, it should be expected that there would be an increase in depreciation rates in the instant case. BGWC is currently depreciating all assets (other than Transportation Equipment) at a rate of 1.5. This 1.5% rate was first established in 1994 in Docket Number 1993-738-WS and was subsequently approved in Docket Number 2000-207-WS in 2001 and Docket Number 2004-357-WS in 2005. This means that the current depreciation rate has been in effect since 1994. It should come as no surprise that an increase in depreciation expense is warranted in this case. A 1.5% depreciation rate amongst all plant accounts is significantly lower than what would generally be expected for these types of assets. The 1.5% depreciation rate was developed absent net salvage, meaning it was based on a composite average service life of approximately 66.67 years for all assets. Based on his testimony, Mr. Garrett does not disagree that this is a longer average service life than is to be expected from both water and wastewater plant accounts; nevertheless, he has only proposed a longer life than 66.67 for two accounts between water and wastewater in his testimony. Many accounts have estimated average service lives that are significantly shorter than the 66.67 average service life that the current composite depreciation rate is based. Absent net salvage, an updated analysis of service lives alone would increase depreciation rates and would do so significantly for some accounts.

[1] Direct Testimony of ORS Witness Garrett at Appendix C, Page 14.

Further, Mr. Garrett does not disagree that there should be a net salvage component to depreciation rates, as it is expected that there will be costs associated with removing utility assets from service. When a net salvage component is added to the depreciation rates it will generally increase the depreciation rates even further than the updated service life estimates. Given these factors, it should be clear why the increase proposed by BGWC and the depreciation study are warranted.

II. NET SALVAGE ESTIMATES

Q. DID ORS WITNESS GARRETT PROPOSE ANY DIFFERENT NET SALVAGE ESTIMATES FOR WATER AND WASTEWATER PLANT?

A. Yes. Please see Table 1 below for the differences proposed by Mr. Garrett. As can be seen from the table, ORS witness Garrett is proposing a 5% or 10% less negative net salvage percent for each of the accounts for which he proposes a change. These changes are based on his belief the net salvage percents proposed in the depreciation study are "excessive."[2]

Table 1: Comparison of BGWC and ORS Net Salvage Estimates

Account	BGWC Proposed	ORS Proposed
WATER PLANT		
Account 1100 Electric Pumping Equipment – Source of Supply	(10)	(5)
Account 1105 Electric Pumping Equipment – Water Treatment	(10)	(5)
Account 1110 Electric Pumping Equipment – Transmission and Distribution	(10)	(5)
Account 1115 – Water Treatment Equipment	(10)	(5)
Account 1120 – Distribution Reservoirs and Standpipes	(15)	(10)
Account 1125 Transmission and Distribution Mains	(10)	(5)
Account 1130 - Services	(20)	(10)
Account 1145 - Hydrants	(15)	(10)

[2] Direct Testimony of ORS Witness Garrett at 38: 5-8.

WASTEWATER PLANT		
Account 1345 – Force Mains	(10)	(5)
Account 1350 – Gravity Mains	(10)	(5)
Account 1353 - Manholes	(10)	(5)
Account 1360 - Services to Customers	(20)	(10)
Account 1380 – Pumping Equipment - Pumping	(10)	(5)
Account 1385 – Pumping Equipment – Reclaim WTP	(10)	(5)
Account 1390 – Pumping Equipment – Reclaim WTR	(10)	(5)
Account 1395 – Treatment and Disposal Equipment - Lagoon	(10)	(5)
Account 1400 – Treatment and Disposal Equipment - Treatment	(10)	(5)
Account 1405 – Treatment and Disposal Equipment – Reclaim WTP	(10)	(5)

Q. ARE THE NET SALVAGE ESTIMATES BASED SOLELY ON HISTORICAL NET SALVAGE DATA?

A. No. Historical net salvage data was not available for Blue Granite Water Company. However, as with all utilities, net salvage should be expected going forward (and I note that Mr. Garrett does not disagree with this concept).[3] The estimates I have proposed are, generally, towards the lower end of the range of net salvage estimates used by most water and wastewater companies.

Q. PLEASE EXPLAIN THE REASON THAT HISTORICAL NET SALVAGE DATA WAS NOT UTILIZED FOR BLUE GRANITE WATER COMPANY.

A. Historically, Blue Granite Water Company has not recorded cost of removal or gross salvage separately on work orders. As established in this study, Blue Granite will separately record cost of removal and gross salvage expense on each work order they perform so that there will be cost of removal and gross salvage transactions associated with all appropriate future work orders. With this change in practice it is necessary to include a

[3] Direct Testimony of ORS Witness Garrett at 38: 22-23 and 39:1.

net salvage component as part of proposed depreciation rates so that the customers who are benefiting from the full service value of the assets are paying their fair share of the net salvage dollars associated with the assets being installed.

Q. DOES MR. GARRETT AGREE THAT THERE SHOULD BE A NET SALVAGE COMPONENT INCLUDED IN THE APPROVED DEPRECIATION RATES FOR BGWC IN THIS CASE?

A. Yes. Mr. Garrett is not arguing that there should be no net salvage collected as part of depreciation rates, but rather that the net salvage percents included in the depreciation rates by the company should be reduced due to their "excessive" nature.

Q. DO YOU BELIEVE THAT THE NET SALVAGE PERCENTS INCLUDED IN THE DEPRECIATION STUDY ARE EXCESSIVE?

A. No. On the contrary, the net salvage percents estimated in the depreciation study are conservative when compared to the estimates used by most water and wastewater companies. Gannett Fleming maintains a list of net salvage estimates for water and wastewater companies. Estimates selected for BGWC were based on the lower (less negative) end of the range for industry net salvage estimates. This process was established in order to transition the full recovery of the service value through depreciation rates consistent with the Company's recording these transactions as net salvage going forward. However, contrary to Mr. Garrett's assertions that the net salvage estimates proposed by BGWC are "excessive," it is important to recognize that they are actually conservative (i.e., less negative) when compared to those used for most other water and wastewater companies.

Q. IS THERE EVIDENCE THAT ORS WITNESS GARRETT'S CLAIM OF THE NET SALVAGE PERCENTS BEING EXCESSIVE MAY BE UNFOUNDED?

A. Yes. My understanding is that Mr. Garrett has testified on few water or wastewater studies. To my knowledge, the one water and wastewater utility company case Mr. Garrett has submitted testimony for was Citizens Energy Group in Indiana. In the current case for BGWC Mr. Garrett claims that the net salvage estimates for 8 water plant accounts and 10 wastewater plants are "excessive". In the only other water and wastewater utility company case Mr. Garrett has submitted testimony for, he supported net salvage estimates that were as negative or more negative than the estimates supported by BGWC for 4 of the 8 water accounts he deems to have been excessive net salvage estimates. In some instances, Mr. Garrett's proposals in the Citizens case were significantly more negative than either he or I propose in the instant case. For example, Mr. Garrett makes the claim that a (20) net salvage estimate for account 1130 Services is excessive when in fact he supported a (50) estimate for the same account in the Citizens case. Regarding the 10 wastewater plant accounts Mr. Garrett is recommending less negative net salvage due to the fact the company's estimates are "excessive", Mr. Garrett proposed estimates that were as negative in the Citizens case for 7 of 10 accounts. The 3 accounts for which he proposed a less negative net salvage for was only less negative by 5%.

Mr. Garrett's claims that the net salvage estimates in the study are excessive are further undermined by the fact that he has only proposed relatively small changes to the net salvage estimates (generally only five percentage points). Mr. Garrett offers no further argument as to why the net savage percents supported in the depreciation study should be changed other than his claim that they are "excessive". When considering the estimates he

supported for Citizens Energy of Indiana, which was his only other water and wastewater utility rate case, Mr. Garrett appears to be taking inconsistent positions in this case.

III. MASS PROPERTY SERVICE LIVES

Q. DID ORS WITNESS GARRETT PROPOSE ANY CHANGES TO ANY OF THE SERVICE LIVES FOR MASS PROPERTY PROPOSED BY BLUE GRANITE WATER COMPANY?

A. Yes. Mr. Garrett proposed changes to the service lives of 19 accounts studied in this case.

Q. PLEASE SUMMARIZE THE ADJUSTMENTS PROPOSED BY MR. GARRETT FOR MASS PROPERTY SERVICE LIVES.

A. Mr. Garrett has proposed adjustments to the survivor curve estimates for 8 water plant accounts and 11 wastewater plant accounts. These adjustments are summarized in the table below:

Table 2: Comparison of BGWC and ORS Proposed Survivor Curves

Account	BGWC	ORS
WATER PLANT		
Account 1050 Structures and Improvements – Source of Supply	50-R3	55-R2.5
Account 1055 Structures and Improvements – Water Treatment	50-R3	55-R2.5
Account 1060 Structures and Improvements – Transmission and Distribution	50-R3	55-R2.5
Account 1065 Structures and Improvements – General	50-R3	55-R2.5
Account 1080 Wells and Springs	45-R1.5	55-R0.5
Account 1115 Water Treatment Equipment	30-R1.5	42-R0.5
Account 1120 Distribution Reservoirs and Standpipes	35-S0.5	40-S0
Account 1125 Transmission and Distribution Mains	70-R2	95-R1
WASTEWATER PLANT		
Account 1290 Structures and Improvements - Collection	50-R1.5	55-L1
Account 1295 Structures and Improvements – Pumping	50-R1.5	55-L1
Account 1300 Structures and Improvements - Treatment	50-R1.5	55-L1

Account 1305 Structures and Improvements – Reclaim WTP	50-R1.5	55-L1
Account 1310 Structures and Improvements – Reclaim WTR	50-R1.5	55-L1
Account 1315 Structures and Improvements - General	50-R1.5	55-L1
Account 1350 Gravity Mains	70-S1.5	95-S1.5
Account 1360 Services to Customers	45-S0	53-L0
Account 1395 Treatment and Disposal Equipment - Lagoon	35-R0.5	40-O1
Account 1395 Treatment and Disposal Equipment - Lagoon	35-R0.5	40-O1
Account 1395 Treatment and Disposal Equipment - Lagoon	35-R0.5	40-O1

As shown in the table, for all the accounts for which Mr. Garrett proposes a change in survivor curve, he is proposing an increase to the average service life as well as a much longer overall life cycle as that recommended in the depreciation study. For many of the accounts the recommendations made by Mr. Garrett are not reasonable. His recommendations result from the approach Mr. Garrett has used to develop his estimates which is based primarily on mathematical curve fitting. This approach does not give proper consideration to the mortality characteristics of the assets studied or to other key factors such as informed judgment and understanding of the nature of the assets in each account which should be considered. These factors will be explained later in this testimony.

A. <u>The Estimation of Service Lives Is Not A Purely Mathematical Exercise and Must Incorporate Informed Judgment</u>

Q. HAS MR. GARRETT USED THE SAME APPROACH TO ESTIMATING SERVICE LIVES AS YOU USED IN THE DEPRECIATION STUDY?

A. No. While both Mr. Garrett and I have used Iowa type survivor curves to calculate depreciation expense and used the retirement rate method to analyze historical data, Mr. Garrett's overall approach differs from mine. His approach also differs from the correct and proper approach to estimating service lives that is set forth in depreciation textbooks such as the National Association of Regulatory Utility Commissioners' (NARUC) *Public*

Utility Depreciation Practices. Specifically, Mr. Garrett's testimony indicates that he believes estimating service lives is primarily a mathematical exercise in which little more than mathematical computations of historical accounting data will result in reasonable estimates. This overall approach is incorrect. Depreciation, and particularly estimating service lives, is a forecast of the future rather than a calculation of what has happened in the past.

Q. PLEASE EXPLAIN IN MORE DETAIL HOW MR. GARRETT'S APPROACH DOES NOT COMPORT WITH THE PROPER MANNER IN WHICH SERVICE LIFE ESTIMATES SHOULD BE DETERMINED.

A. Consider, as an example, the following statement from Mr. Garrett's testimony in which he describes his approach. He is asked if he always selects the "mathematically best-fitting curve," and after responding that he does not necessarily always do so, Mr. Garrett states the following:

> Mathematical fitting is an important part of the curve-fitting process because it promotes objective, unbiased results. While mathematical curve-fitting is important, however, it may not always yield the optimum result. For example, if there is insufficient historical data in a particular account and the OLT curve derived from that data is relatively short and flat, the mathematically "best" curve may be one with a very long average life. However, when there is sufficient data available, mathematical curve fitting can be used as part of an objective service life analysis.[4]

Mr. Garrett's testimony gives the impression that mathematical results should generally be accepted, and instances in which the proper service life estimate is not a best "mathematical fit" would be a relatively unusual exception (such as if there is insufficient data). His

[4] Direct Testimony of ORS Witness Garrett at 14:13-19.

reasoning for reliance on mathematical results is that doing so promotes "objectivity." While one may wish for objective results, so as to remove uncertainty and presumably to make the job of estimating service lives easier, the objectivity sought by Mr. Garrett is neither realistic nor desirable in the development of a true forecast of the future. Further, authorities on the topic of depreciation, such as NARUC, are clear that estimating service lives must include a subjective component.

Q. DOES NARUC EXPLAIN THE IMPORTANCE OF A SUBJECTIVE COMPONENT TO ESTIMATING SERVICE LIVES?

A. Yes. NARUC explains that there must be a subjective component to estimating service lives. Chapter XIII of *Public Utility Depreciation Practices*, entitled "Actuarial Life Analysis" discusses and emphasizes the subjective nature of the process of estimating service lives. NARUC starts this chapter by explaining that the analysis of historical data is only one part of the process of estimating service lives:

> Actuarial analysis objectively measures how the company has retired its investment. The analyst must then judge whether this historical view depicts the future life of the property in service. The analyst takes into consideration various factors, such as changes in technology, services provided, or capital budgets.[5]

NARUC further explains that the process of estimating service lives must go beyond any objective measurement of the past. In describing the determination of a survivor curve estimate (referred to as the "projection life" in this passage), NARUC states:

> The projection life is a projection, or forecast, of the future of the property. Historical indications may be useful in estimating a projection life curve. Certainly the observations based on the property's history are a starting point. Trends in life or retirement dispersion can often be expected to

[5] National Association of Regulatory Utility Commissioners, *Public Utility Depreciation Practices*, 1996, p. 111.

> continue. Likewise, unless there is some reason to expect otherwise, stability in life or retirement dispersion can be expected to continue, at least in the near term.
>
> Depreciation analysts should avoid becoming ensnared in the mechanics of the historical life study and relying solely on mathematical solutions. The reason for making an historical life analysis is to develop a sufficient understanding of history in order to evaluate whether it is a reasonable predictor of the future. The importance of being aware of circumstances having direct bearing on the reason for making an historical life analysis cannot be understated. These circumstances, when factored into the analysis, determine the application and limitations of an historical life analysis.[6]

Thus, NARUC strongly advises against the approach used by Mr. Garrett, stating clearly that "relying solely on mathematical solutions" should be avoided. NARUC further elaborates on the need for a subjective component to forecasting service lives:

> A depreciation study is commonly described as having three periods of analysis: the past, present, and future. The past and present can usually be analyzed with great accuracy using many currently available analytical tools. The future still must be predicted and must largely include some subjective analysis. *Informed judgment* is a term used to define the subjective portion of the depreciation study process. It is based on a combination of general experience, knowledge of the properties and a physical inspection, information gathered throughout the industry, and other factors which assist the analyst in making a knowledgeable estimate.
>
> The use of informed judgment can be a major factor in forecasting. A logical process of examining and prioritizing the usefulness of information must be employed, since there are many sources of data that must be considered and weighed by importance. For example, the following forces of retirement need to be considered: Do the past and current service life dispersions represent the future? Will scrap prices rise or fall? What will be the impact of future technological obsolescence? Will the company be in existence in the future? The analyst must rank the factors and decide the relative weight to apply to each. The final estimate might not resemble any

[6] National Association of Regulatory Utility Commissioners, *Public Utility Depreciation Practices*, 1996, p. 126 (emphasis added).

> one of the specific factors; however, the result would be a decision based upon a combination of the components.[7]

Q. HAVE YOU INCORPORATED THE VARIOUS FACTORS DISCUSSED BY NARUC INTO YOUR ESTIMATES?

A. Yes. For the depreciation study, I conducted site visits and discussions with Company personnel to familiarize myself with the Company's assets. In addition, throughout my career, I have performed hundreds of depreciation studies for numerous utilities. The information obtained from this experience has also been incorporated into my recommendations.

Q. HAS MR. GARRETT INCORPORATED THESE FACTORS INTO HIS RECOMMENDATIONS?

A. No, at least not to the degree necessary to develop a reasonable forecast. Mr. Garrett describes his differences from my proposals as follows:

> Generally, for the accounts in which I propose a longer service life, that proposal is based on the objective approach of choosing an Iowa curve that provides a better mathematical fit to the observed historical retirement pattern derived from the Company's plant data.[8]

Again, estimating service lives is not and should not be a purely mathematical exercise and must incorporate some degree of subjective expert analysis. Mr. Garrett's process for estimating service lives, as described in his testimony, does not follow the proper approach of incorporating informed judgment. He makes no arguments based on any information other than statistical results as to why the survivor curves he selected are more appropriate

[7] National Association of Regulatory Utility Commissioners, *Public Utility Depreciation Practices*, 1996, p. 128 (emphasis added).

[8] Direct Testimony of ORS Witness Garrett at 15:17-20.

estimates than the estimates proposed in the depreciation study. Further, as I will explain later in my testimony, his actual estimates support that he did not properly consider all of the relevant factors needed to develop reasonable service life estimates.

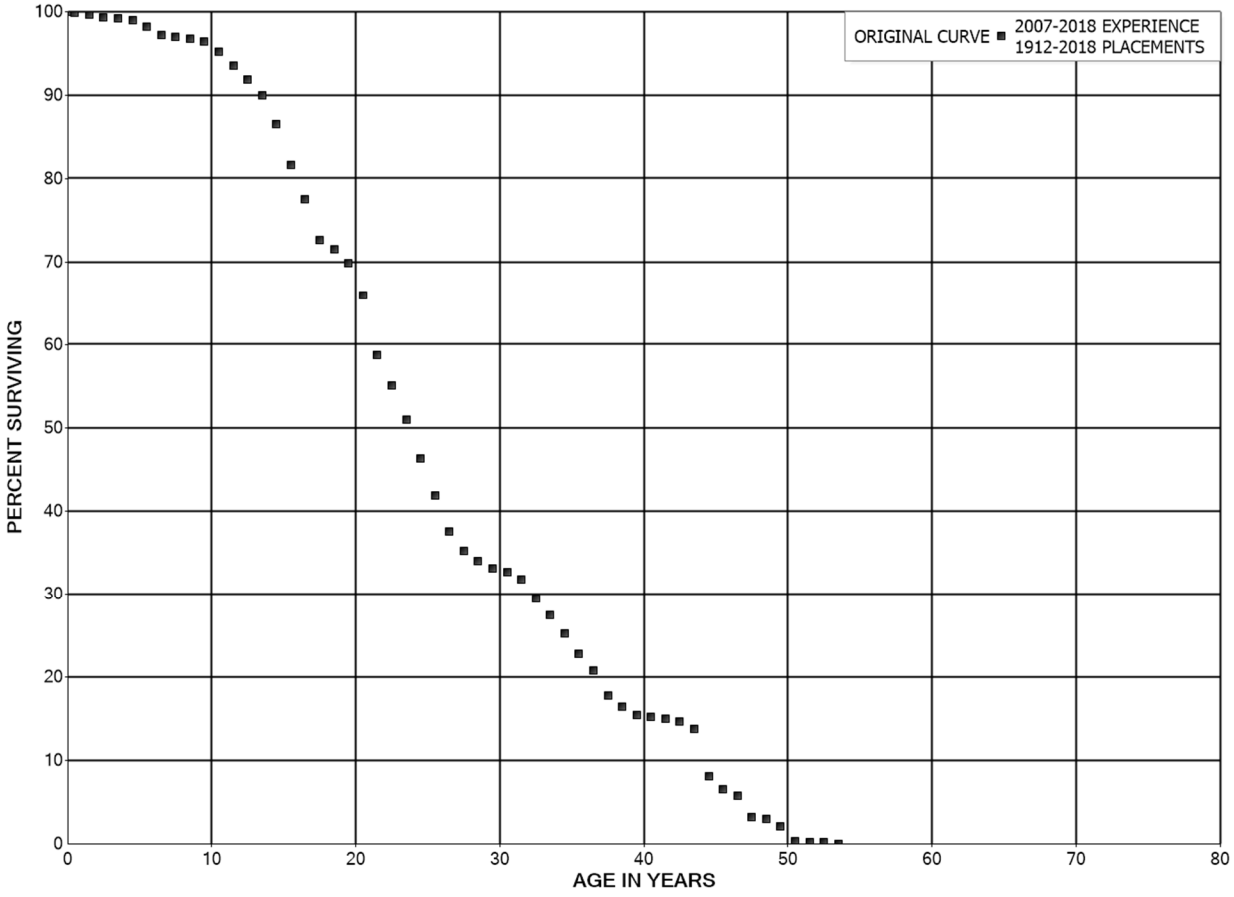
B. The Curve Fitting Process Must Also Incorporate Informed Judgment

Q. PLEASE BRIEFLY DESCRIBE THE CURVE FITTING PROCESS USED IN A DEPRECIATION STUDY.

A. As described in both Mr. Garrett's testimony and in my Depreciation Study, the method of statistical life analysis used is referred to as the retirement rate method. The retirement rate method is used when aged data are available (i.e., the vintage year of historical transactions are known, which means that the age of each transaction can be determined). The retirement rate method develops an original life table[9] ("OLT") or a series of original life tables for each depreciable group. An OLT presents calculations, based on the historical data, of the percentage of plant that has survived to a given age. The OLT can also be shown graphically with age in the x-axis and the percent surviving in the y-axis. An example of an original life table graph for the full experience and placement bands for water plant Account 1130, Services is provided in Figure 1 below. The life table itself is presented on pages VII-23 through VII-25 of the water plant depreciation study.

[9] Original life tables may also be referred to as "observed life tables" or the shorthand "life tables."

Figure 1: Graph of Original Life Table for Water Plant Account 1130, Services



For the curve fitting process, the analyst can fit or match standard Iowa survivor curves to the data from an original life table. This can be performed either visually or mathematically. For visual curve matching, Iowa curves are graphed on the same graph as the OLT. For mathematical curve matching, the mathematical deviation from a given Iowa curve to the OLT is calculated for each data point. The lower the difference between a given survivor curve, the better the mathematical fit.

Q. ARE THERE ADVANTAGES AND DISADVANTAGES TO BOTH VISUAL AND MATHEMATICAL CURVE MATCHING?

A. Yes. Visual curve matching offers a number of advantages over mathematical curve matching. Different ranges of data points can be given more or less emphasis depending on the characteristics of the account. It is easier to identify irregularities in the data when performing visual curve matching. Visual curve matching also allows the analyst to view the full Iowa survivor curve to assess whether the full life cycle forecast by the curve is reasonable for the property studied.

Many years ago, a disadvantage of visual curve matching was that it was cumbersome due to the need to manually overlay standard curves on plots of original life tables. However, since the advent of computers with sophisticated graphical capabilities, visual curve matching has become easier and more efficient. As a result, in recent decades the advantages of visual curve matching have made it more prominent and it is used by most depreciation analysts.

Mr. Garrett discusses advantages of mathematical curve matching in his testimony, including his opinion that it promotes "objective, unbiased results."[10] While it is true that mathematical curve matching provides a numerical value on which the "fit" of a curve can be assessed, Mr. Garrett does not discuss the disadvantages of mathematical curve matching or that mathematical curve matching can also introduce biases. One of the disadvantages of mathematical curve matching is that it treats every data point within a range of fit equally. Different data points are typically based on different levels of data and different ages (e.g., older data points typically are based on much smaller levels of investment than earlier data points). There is not a good way to de-emphasize data

[10] Direct Testimony of ORS Witness Garrett at 14:14.

irregularities when performing mathematical curve matching, other than to exclude older data points entirely.

Mathematical curve matching can also introduce biases due to the nature of the calculations. Mathematical fitting indicators are typically calculated by squaring the differences between the OLT points and a given Iowa curve. As a result, the mathematical curve fitting routine will amplify larger differences between the Iowa curve and OLT. Because data irregularities are often common towards the end of the curve when smaller amounts of data are available, the real-world result is that mathematical curve matching will amplify less meaningful deviations towards the end or "tail" of the curve. That is, differences in curve fitting indicators are often the result of data irregularities and do not provide as meaningful of an indication of the historical life indications. For this reason, if proper care is not taken when interpreting the results, mathematical curve fitting can mislead the analyst into selecting a curve that is not representative of the predominant mortality characteristics of the depreciable group studied.

Q. GIVEN ALL OF THE CONSIDERATIONS DISCUSSED ABOVE, HOW DO YOU APPROACH THE CURVE FITTING PROCESS?

A. I believe that both mathematical and visual curve fitting should be used. Using both approaches enhances the information available to the analyst and aids in developing the most reasonable forecast. Importantly, the analyst should also understand the advantages and disadvantages of both approaches so as to not be misled by the results.

Q. DOES THE USE OF JUDGMENT ALSO APPLY TO THE ANALYSIS OF THE HISTORICAL DATA CURVE MATCHING PROCESS?

A. Yes. There are numerous reasons why informed judgment must also be applied to the mathematical processes of analyzing historical data, including the availability and limitations of the historical data; the interpretation of trends in the data; the interpretation of data irregularities; which data points to include or emphasize in mathematical or visual curve matching; and whether the curve fitting results are reasonable for the types of assets studied. That judgment is necessary when evaluating the statistical analysis is also explained by NARUC. For example, when discussing a stub (or incomplete) survivor curve, NARUC states:

> The longer the stub, the more reliable the resulting curve fit and extension. As a result, the analyst may be forced to choose between a more reliable longer stub, which by necessity reflects older data, and a less reliable shorter stub, which reflects more recent vintages and, therefore, is more likely to reflect the future.[11]

NARUC also presents a discussion of "Data Irregularities," which are explained as follows:

> Property that exhibits homogeneous life characteristics produces smooth survivor curves. Many of a utility's property accounts, however, have experienced change in the forces of retirement due to, for example, changes in a utility's services or capital budgets. These accounts may exhibit a number of data irregularities. For example, the survivor curves may look like stair steps as the different changes take effect. Extended leveling-off periods may result from delayed booking of retirements during an accounting system conversion. Irregularities at the older ages of the survivor curve often result from inadequate exposures.[12]

NARUC explains certain types of occurrences in more detail, such as "Bimodality" (or "the presence of two peaks on the retirement frequency curve"). Also discussed is the use of a "T-Cut" (or "truncation cut"), in which data points from an observed life table are

[11] National Association of Regulatory Utility Commissioners, *Public Utility Depreciation Practices*, 1996, p. 129.

[12] National Association of Regulatory Utility Commissioners, *Public Utility Depreciation Practices*, 1996, p. 122.

excluded from mathematical curve fitting (for visual curve fitting, data points can be ignored in a similar manner). NARUC's explanation again illustrates the importance of judgment:

> Careful selection of a T-Cut can greatly enhance the reliability of the resulting analysis. Conversely, since the use of a T-Cut involves truncating the observed data, careless selection can impair the reliability of subsequent work.[13]

Read in its entirety, this section of *Public Utility Depreciation Practices* should make clear the need for judgment with regard to numerous decisions when performing the statistical analysis. Judgment must be exercised throughout the process in order to determine the most appropriate and reasonable estimate.

C. Account by Account Analysis

1. Accounts 1050, 1055, 1060 and 1065 Structures and Improvements

Q. WHAT DID THE PARTIES PROPOSE FOR SERVICE LIFE ESTIMATES FOR THIS ACCOUNT?

A. For this account, I proposed the 50-R3 survivor curve. ORS witness Garrett proposed a longer service life and recommends the 55-R2.5 survivor curve.

Q. WHAT REASONS DOES MR. GARRETT PROVIDE FOR RECOMMENDING A LONGER SERVICE LIFE THAN YOUR ESTIMATE?

A. Mr. Garrett relies solely on mathematical results for his recommended survivor curve for this account. However, in only looking at the mathematical results he does not properly recognize the trend in the original life table; gives consideration to older data points that

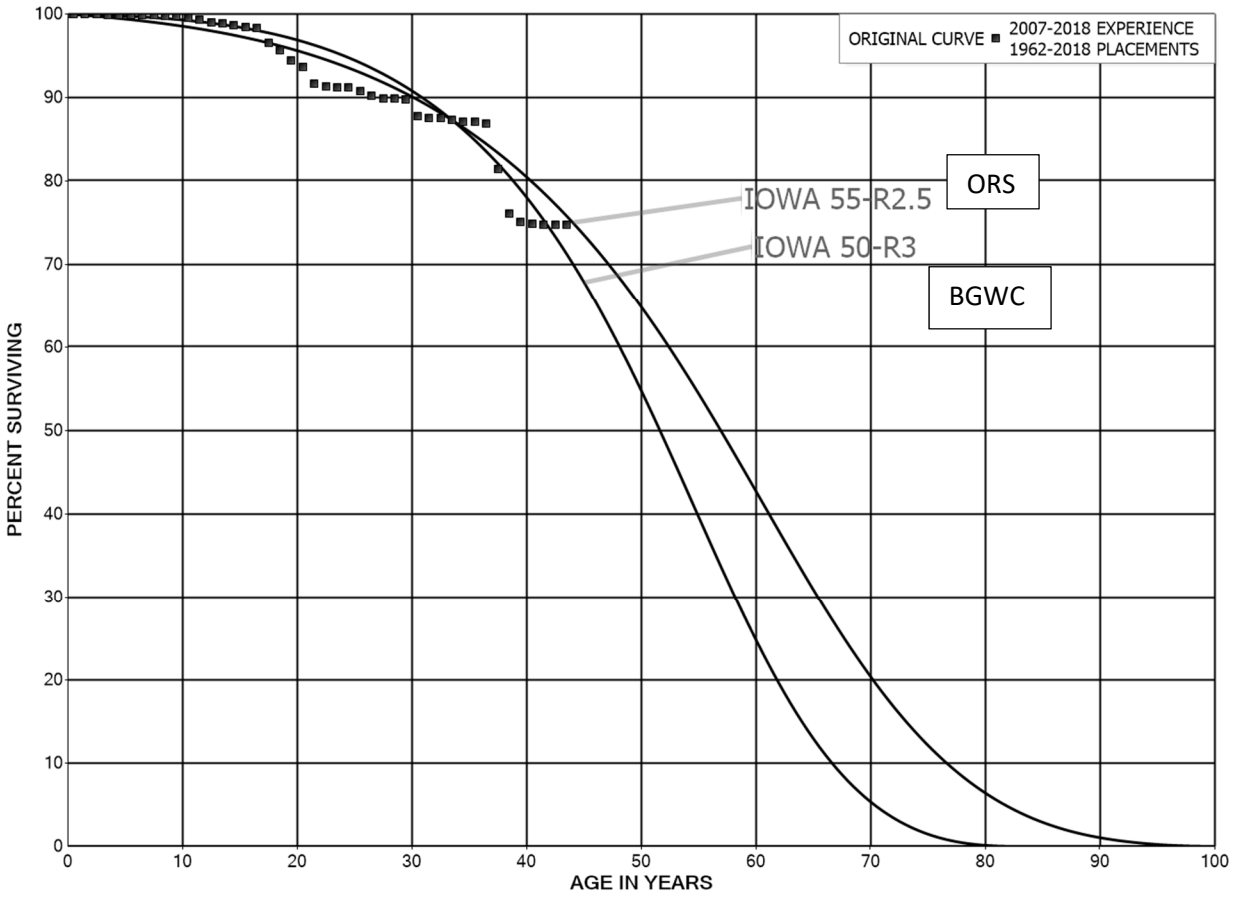
[13] National Association of Regulatory Utility Commissioners, *Public Utility Depreciation Practices*, 1996, p. 122.

are not as representative of the survivor characteristics for the account; and does not consider all relevant factors that are needed when estimating survivor curves.

Q. PLEASE PROVIDE REASONS WHY YOUR ESTIMATE IS MORE REASONABLE THAN THAT PROPOSED BY MR. GARRETT.

A. Figure 2 below, which compares both estimates to the most relevant data points from the OLT, demonstrates that the survivor curve I proposed better recognizes the increasing pattern of retirements from ages 30 to 40 in the historical data than Mr. Garrett's estimate. It can be seen visually from the two estimates in Figure 2 that Mr. Garrett's estimate is a decent fit for most of the data but appears to just miss the last set of data points. The OLT curve exhibits a level of retirements for these latter data points that Mr. Garrett's survivor curve does not properly reflect whereas the 50-R3 I proposed takes those data points into consideration.

Figure 2: Accounts 1050, 1055, 1060 and 1065, Structures and Improvements - Comparison of OLT Curve with BGWC and ORS Survivor Curve Estimates



Mr. Garrett decided to rely on all the data points from the OLT curve when choosing his estimate for this account. As discussed above in this testimony there are certain factors an analyst must consider when conducting life analysis. One is the reasonableness and reliability of the data. The comparison of the curves provided in Mr. Garrett's testimony[14] includes more data points than what is pictured in Figure 2 and what was included in the depreciation study. As can be seen in the referenced Figure 3 from Mr. Garrett's testimony, the data points beyond age 40 begin to level out and "tail" off. This is an indication that

[14] Direct Testimony of ORS Witness Garrett at Figure 3 on page 18.

the data for these ages is less reliable than the data for earlier ages and thus should not be considered when making an estimate for this account. Mr. Garrett includes these less reliable data points in his analysis and thus in his calculation of goodness of fit. Seeing as the mathematical goodness of fit is Mr. Garrett's only argument for a longer life survivor curve, and that his mathematical calculation includes unreliable data points, the 50-R3 proposed by the company in the depreciation study is the more appropriate estimate for this account.

2. Account 1080 Wells and Springs

Q. WHAT DID THE PARTIES PROPOSE FOR SERVICE LIFE ESTIMATES FOR THIS ACCOUNT?

A. BGWC proposed a survivor curve estimate of 45-R1.5 for this account, while ORS witness Garrett proposed a substantial ten-year increase in average service life and 25 year increase in maximum life from my estimate and recommends the 55-R0.5 survivor curve.

Q. WHAT IS ORS WITNESS GARRETT'S REASON FOR PROPOSING SUCH A LARGE INCREASE IN SERVICE LIFE FROM WHAT THE COMPANY PROPOSED?

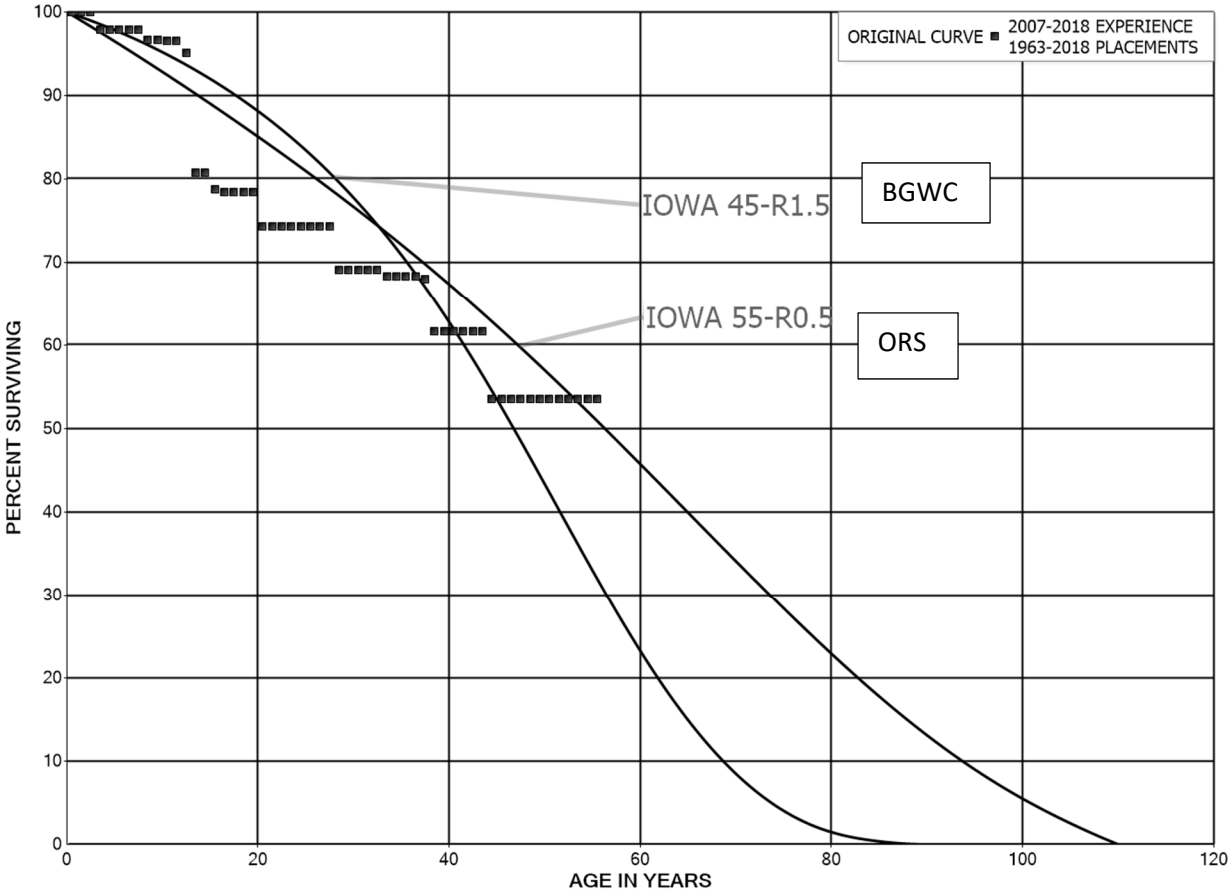
A. Much like the discussion for the Structures and Improvements accounts from the previous section, Mr. Garrett has based his recommendation entirely on mathematical curve fitting results which do not exclude portions of the OLT curve that are less meaningful. Similar to the OLT curve for the Structures and Improvements accounts, the OLT curve for Account 1080 begins to flatten out around age 44, with no retirements in the data occurring after that age. When visually fitting a curve for this account, this flattening out can be seen clearly, and it is well understood that this can occur towards the end of the OLT curve due

to lower levels of exposures and the data becoming less reliable. These points should not be given the same consideration as the data points prior to age 44. When analyzing Figure 3 below, the BGWC proposed survivor curve is a much better fit of the data through age 13, and then considers the trend of increasing retirements from ages 38 to 43 and smooths out some of the "stair steps" that can be seen in the data. In contrast, Mr. Garrett's selection comes from the mathematical best fit of the data, giving all data points equal consideration (including less relevant data not shown in the graph below).

Q. ARE THERE ANY OTHER ISSUES WITH THE SERVICE LIFE CHOSEN BY MR. GARRETT FOR THIS ACCOUNT?

A. Yes. The average service life of 55 years chosen by Mr. Garrett for this account is at the upper range of industry estimates. Based on estimates for other utilities, a 55-year average service life is the highest estimate for an average service life of this account, with 40-45 years being the most frequent estimates. Mathematical fitting alone is not a valid reason to propose a ten-year higher average service life for this account that is at the very upper range of estimates for other water utility companies, particularly when the estimate I have recommended is also a good fit of the representative data points (as can be seen in Figure 3 below).

Figure 3: Account 1080 Wells and Springs - Comparison of OLT Curve with BGWC and ORS Survivor Curve Estimates



3. Account 1115 Water Treatment Equipment

Q. WHAT DID THE PARTIES PROPOSE FOR THE SERVICE LIFE ESTIMATES FOR THIS ACCOUNT?

A. The Company proposed a 30-R1.5 survivor curve estimate for this account. ORS witness Garrett chose a survivor curve with a twelve-year increase in service life from the company proposed survivor curve and recommended the 42-R0.5.

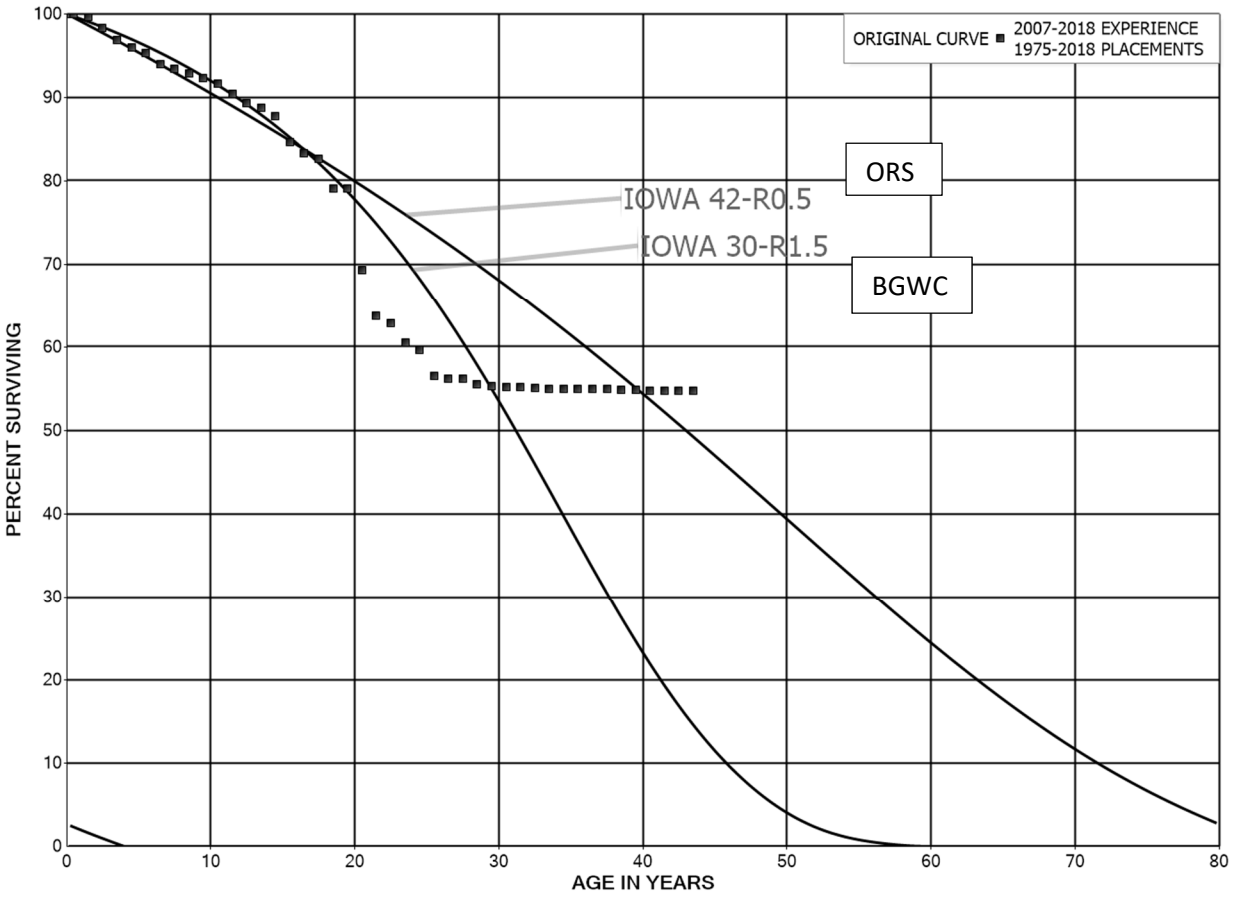
Q. WHAT ARE THE ISSUES WITH THE ESTIMATE PROPOSED BY ORS WITNESS GARRETT?

A. Mr. Garrett's approach to his estimate is the same for this account as it has been for the previous accounts discussed in this section. He relies solely on mathematical fit and completely disregards visual curve fitting and the subjective portion of life analysis.

Q. IS THE SURVIVOR CURVE PROPOSED IN THE DEPRECIATION STUDY A BETTER FIT TO THE MOST RELEVANT PORTION OF THE OLT CURVE THAN THE SURVIVOR CURVE PROPOSED BY MR. GARRETT?

A. Yes. As was the issue with the previously discussed accounts, Mr. Garrett is giving every data point equal weight when developing his estimate and using only a mathematical goodness of fit. Figure 4 below helps to demonstrate both the importance of visual curve fitting and of the importance of considering the relevance of different data points. The 30-R1.5 survivor curve proposed by the company is the superior fit to the data points through about age 30. This portion of the OLT curve is far more relevant and indicative of the lives of assets in this account than the data from age 30 and beyond. This is because, as can be seen in Figure 4 below, there is a leveling out of the data and beyond age 30 there are no recorded retirements. When looking at the data points through age 30 it can be seen that the percent surviving is decreasing through age 30, and it would be logical to assume this trend to continue to for ages beyond age 30. Currently, the data at these older ages is not as reliable for determining the service life for this account as the data prior to age 30.

Figure 4: Account 1115 Water Treatment Equipment – Comparison of OLT Curve with BGWC and ORS Proposed Survivor Curves



4. Account 1120 Distribution Reservoirs and Standpipes

Q. WHAT SERVICE LIFE ESTIMATES HAVE THE PARTIES RECOMMENDED FOR THIS ACCOUNT?

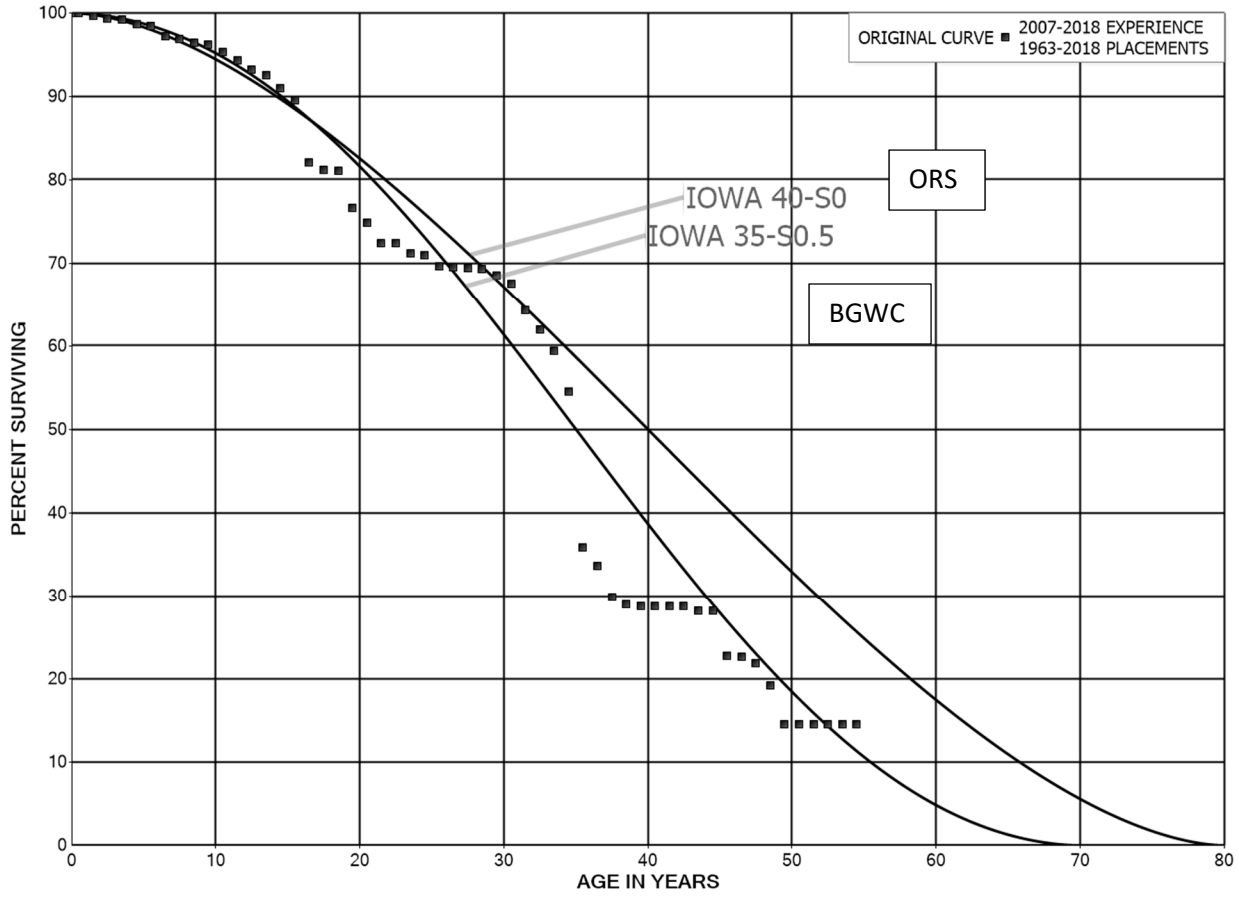
A. The company has proposed the 35-S0.5 survivor curve for this account. ORS witness Garrett has proposed a longer service life and recommends the 40-S0 survivor curve.

Q. WHAT IS THE PRIMARY REASON MR. GARRETT HAS PROPOSED A LONGER SERVICE LIFE FOR THIS ACCOUNT?

A. The reason Mr. Garrett has proposed a longer service life for this account is that he has chosen to completely ignore all data points from age 35 and older. I note that this is a

different approach from the accounts discussed previously, for which he included all data points. His analysis yields the mathematical best fit curve to the data through age 35, while the estimate proposed by the company considers, but does not solely rely on the retirement data past age 35. Figure 5 compares both estimates to the historical data, including data beyond age 35.

Figure 5: Account 1120 Distribution Reservoirs and Standpipes – Comparison of OLT Curve with BGWC and ORS Survivor Curve Estimates



Q. SHOULD THE RETIREMENT DATA FROM AGES 35 AND OLDER BE IGNORED FOR THIS ACCOUNT?

A. No. While it is sometimes appropriate to make a T-Cut in the data, or to ignore some data points from the OLT curve that are older and less reliable, this is not one of those situations.

Mr. Garrett claims that the retirement made at age 35 and subsequent retirements should be ignored when completing life analysis for this account because he deems these retirements "less statistically relevant."[15] He gives no reason for the alleged statistical irrelevancy of these data points other than that it was a large retirement and there was a steep drop off in the OLT curve. He offers no specifics on what assets were retired or why he deems these retirements to be irrelevant to the data.

In his discussion of his process for this account, Mr. Garrett mentions the "1% rule". He states "[a]s a general rule, some depreciation analysts, including me, consider truncating the OLT curve at a point where the dollars exposed to retirement are less than 1% of initial exposures. The removed, truncated portion of the OLT curve is the statistically insignificant "tail end" discussed above."[16] This quote implies that the data points with less than 1% of exposures are statistically insignificant, from which it would follow that the data points with more than 1% of exposures would be statistically significant.[17] However, Mr. Garrett's actual approach for this account is not consistent with this statement, as the T-cut he makes in the data is at a point where the data is at 7% of exposures and the data does not reach 1% of exposures until age 48. Mr. Garrett ignores 13 years of data for which his own testimony would imply is relevant to the statistical analysis.

Q. IS THERE ANOTHER REASON THAT MR. GARRETT'S T-CUT FOR THIS ACCOUNT IS NOT APPROPRIATE?

[15] Direct Testimony of ORS Witness Garrett at 25: 5-6.

[16] Direct Testimony of ORS Witness Garrett at 24: 12-15.

[17] This is not to say data points with more than 1% of exposures should be relied upon completely, but that they are often significant to the analysis.

A. Yes. The life characteristics of the assets contained in this account must be considered as part of the life analysis. The assets contained in this account are large, high dollar assets. It is not unusual to see less frequent, but high dollar retirements for assets in this account. With that in mind, Mr. Garrett is choosing to ignore data because there was a high dollar retirement at a somewhat older age in the data. This retirement should not be ignored and should instead be expected to be somewhat common for this account. Again, Mr. Garrett provides no discussion of the details of the retirement that took place at this age and why he believes that this specific retirement should not be considered to be a normal retirement. When considering the nature of the assets in this account it is clear that the data beyond age 35 is still relevant to our analysis.

Q. IS MR. GARRETT'S ESTIMATE THE MORE APPROPRIATE ESTIMATE FOR THIS ACCOUNT?

A. No. The company proposed 35-S0.5 is the appropriate life estimate for this account. As can be seen in Figure 5, the 35-S0.5 is a good fit for the entire OLT curve, including the more relevant earlier ages, as well as the later ages of data. The 35-S0.5 does a good job of smoothing the entire curve, which is the intention of the curve-fitting process. It is a better fit than Mr. Garrett's once more of the relevant data points are given the proper consideration.

5. Account 1125 Transmission and Distribution Mains

Q. WHAT DID THE PARTIES PROPOSE FOR SERVICE LIFE ESTIMATES FOR THIS ACCOUNT?

A. The company proposed the 70-R2 survivor curve for this account. Mr. Garrett chose a 95-R1 survivor curve for this account which represents a substantial 25-year increase in average service life from the company proposed estimate.

Q. WHY IS MR. GARRETT PROPOSING SUCH A LARGE INCREASE TO THE PROPOSED SERVICE LIFE?

A. Similar to many of the previous accounts, Mr. Garrett includes too many data points in his analysis and strictly bases his recommendation on statistical best fit results. He gives equal weighting to older data points with less relevance than younger data points for which there is much more reliable and robust data.

Q. MR. GARRETT CLAIMS THAT YOU RECOMMENDED AN AVERAGE LIFE OF 125 FOR THIS ACCOUNT FOR CITIZENS ENERGY GROUP IN INDIANA. IS THIS CORRECT?

A. Yes. However, the recommendations in each study are based on the specifics of the assets being studied and, as a result, average service life estimates can vary significantly from company to company. For example, I have also recommended an average service life of as low as 55 years for this account for different utilities. One single isolated estimate for one company, in a different state, with different operational procedures, management and service territory, is not controlling and provides limited value in determining the proper estimate in this case.

Q. DOES THE MATERIAL OF THE MAINS IN THIS ACCOUNT PROVIDE ANY RELEVANT INFORMATION TO INFORM THE LIFE ESTIMATE FOR THIS ACCOUNT?

A. Yes. The mixture of materials used for mains is important information to consider when estimating the service life of this account. Based on company data and discussions with management and field personnel during field visits it, most of the mains in this account are made of PVC as opposed to steel or metal. Across the industry PVC mains typically have a shorter life than their steel or metal counterparts. With that in mind, the 95-year life proposed by Mr. Garrett is too long for the types of assets in this account. PVC piping is not expected to last 95 years on average. If this account had a different blend of material that included more steel or metal piping than maybe a 95-year average life would be appropriate. Considering most of the assets in this account are made from PVC, the 70-year average service life proposed by the company is much more realistic.

6. Accounts 1290 Thru 1315 Structures and Improvements

Q. WHAT DID THE PARTIES PROPOSE FOR SERVICE LIFE ESTIMATES FOR THESE ACCOUNTS?

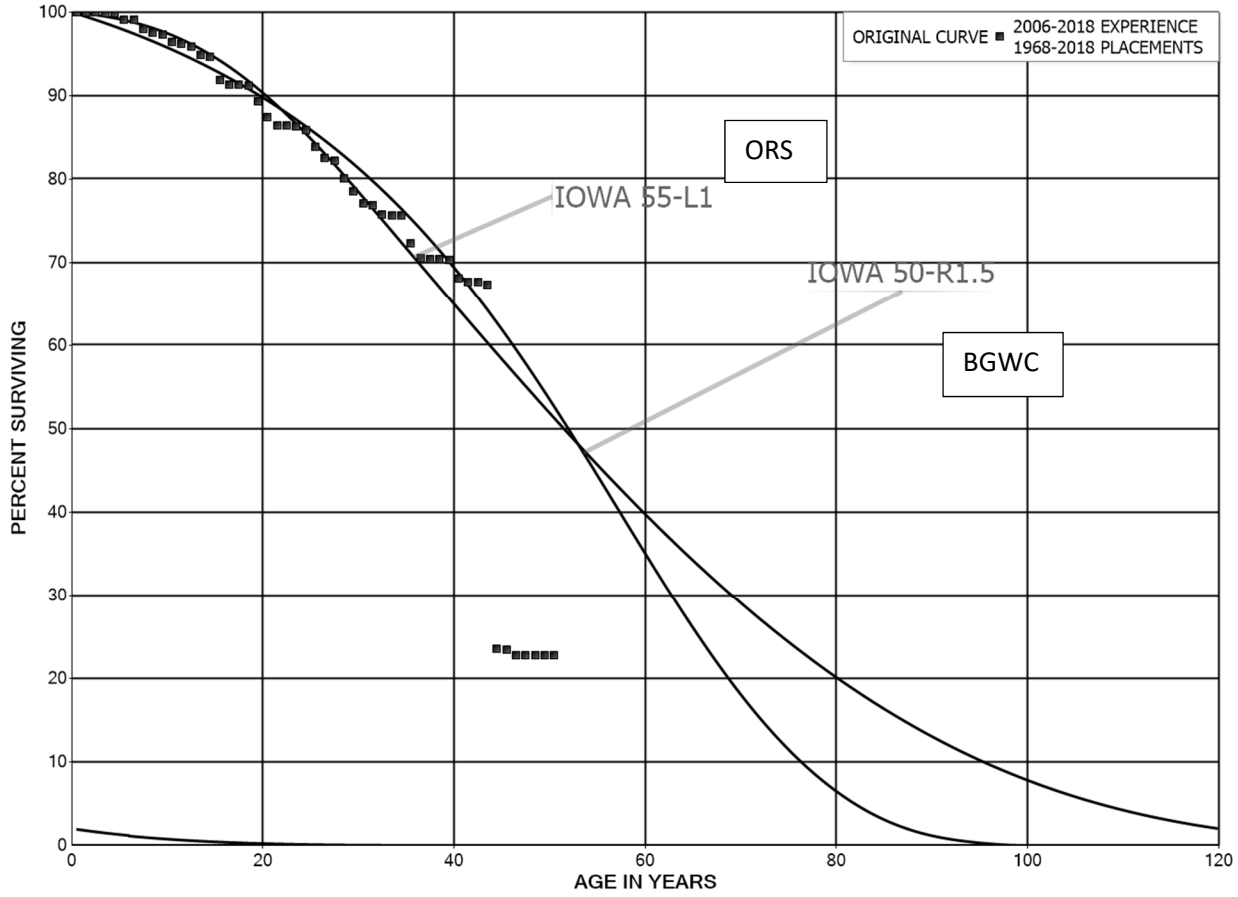
A. The company proposed the 50-R1.5 survivor curve in the depreciation study. ORS witness Garrett proposed a longer service life by recommending the 55-L1 survivor curve.

Q. SHOULD ORS WITNESS GARRETT'S PROPOSED SURVIVOR CURVE BE APPROVED FOR THESE ACCOUNTS?

A. No. Mr. Garrett's recommendation for these accounts is again based solely on mathematical curve fitting results. Although for this account Mr. Garrett did analyze a more appropriate range of data points to determine his goodness of fit on, he ignores relevant information from the historical data. Figure 10 from Mr. Garrett's testimony does not include the ages and percent surviving past age 50 for his survivor curve. Figure 6 below provides the entire OLT curve and proposed curves. It can be seen that Mr. Garrett's

55-L1 estimate has a maximum life of just less than 140 years. In addition, his survivor curve is showing that nearly 10% of these accounts will be surviving at age 100. The oldest assets in these accounts currently are 51 years old and, as a result, his recommended maximum life for the account is not based on actual data.

Figure 6: Accounts 1290 Thru 1315 Structures and Improvements - Comparison of OLT Curve with BGWC and ORS Survivor Curve Estimates



7. Account 1350 Gravity Mains

Q. WHAT DID THE PARTIES PROPOSE FOR SERVICE LIFE ESTIMATES FOR THIS ACCOUNT?

A. The company is proposing a survivor curve estimate of 70-S1.5 for this account. ORS witness Garrett proposes to increase the service life of the proposed estimate by a substantial 15 years and recommends the 95-S1.5 survivor curve.

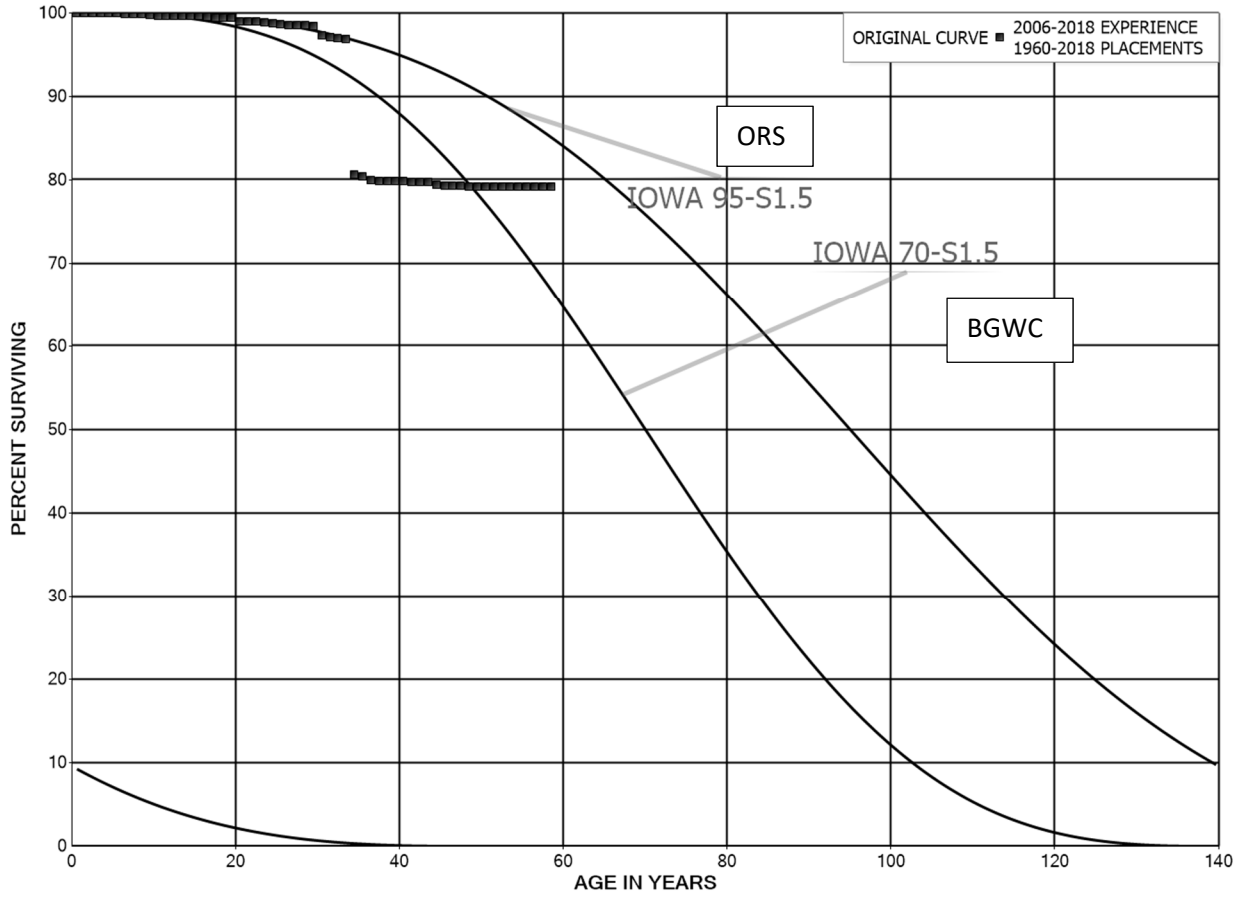
Q. IS ORS WITNESS GARRETT'S PROPOSED SURVIVOR CURVE FOR THIS ACCOUNT APPROPRIATE?

A. No. Mr. Garrett's recommended service life of 95 years for this account is not appropriate for this account. He puts forth the same arguments for this account as was the case for water plant account 1120. He believes that since there was a large retirement, then that retirement should be completely removed from the life analysis process. There is a large retirement for this account at age 34 that Mr. Garrett feels should be ignored and his only reason for this ignorance is the simple fact that it is a large retirement. There is no detail provided by Mr. Garrett on the specific assets that were retired or the circumstances of their retirement that lead him to believe that these retirements should be ignored. His only justification for them not being included in the analysis is because they are "sudden and significant".

Revisiting the "1% rule" discussion from Account 1120, Mr. Garrett states that OLT curves should be cut off at the point they reach 1% of the initial exposures. The cut that Mr. Garrett makes for this account occurs at 54% of the exposures for the account. Based on his assertion that OLT curves contain relevant data until the OLT curve reaches 1% of exposures, it should follow that the retirement Mr. Garrett is choosing to ignore for this account should be considered in life analysis. The survivor curve proposed by the company for this account considers the retirement Mr. Garrett ignores but does not fit their survivor curve to it strictly. Absent any concrete evidence that the specific retirements at

age 34 should be excluded, these retirements need to at least be considered when developing the service life estimate for this account.

Figure 7: Account 1350 Gravity Mains - Comparison of OLT Curve with BGWC and ORS Proposed Curves



8. Account 1360 Services to Customers

Q. WHAT SERVICE LIFE ESTIMATES DID THE PARTIES PROPOSE FOR THIS ACCOUNT?

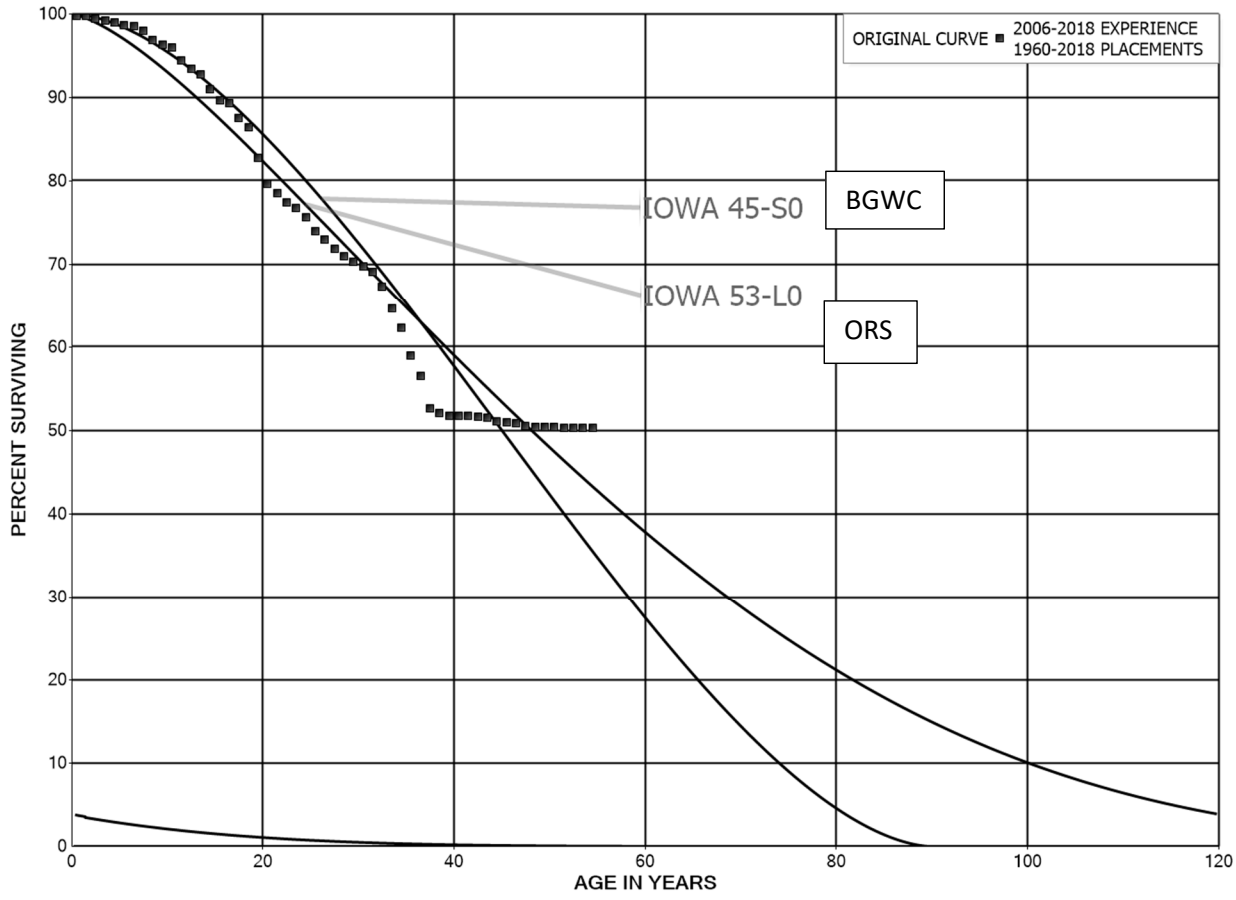
A. The company proposed a service life estimate of 45-S0 for this account. ORS witness Garrett proposed a service life increase by recommending the 53-L0 survivor curve.

Q. DESCRIBE THE ISSUES WITH ORS WITNESS GARRETT'S SERVICE LIFE ESTIMATE FOR THIS ACCOUNT.

A. Much like he has with other accounts, Mr. Garrett relies solely on mathematical curve fitting to determine his estimate. To compound that issue, Mr. Garrett is giving all data points on the OLT curve equal weighting when they should not be given equal weighting. There is a clear leveling out of the OLT curve at age 37 that suggests the data at that point has become less reliable than data at earlier ages. When taking this into consideration the 45-S0 is mathematically and visually the better fit of the data set.

Additionally, Mr. Garrett intentionally remitted the entire graph of percent surviving and ages in his Figure 14 comparison in his testimony. See Figure 8 below for the entire OLT curve included in the depreciation study as well as the survivor curve estimates from the company and ORS. As can be seen in Figure 8, the BGWC proposed curve is a better fit to the more relevant data points which occur before the leveling out of the data. One other thing to note from Figure 8 is that the ORS survivor curve suggests that 5% of the assets in this account will survive until 120 years with the maximum life being around 150 years. The oldest current assets in this account are 59 years old. To imply that this account has a maximum age of 150 years is not based on any actual data and is not reasonable for the types of assets in this account. Much like account 1125, most of the pipe that BGWC has in the ground is PVC and PVC does not last as long as steel or metal piping.

Figure 8: Account 1360 Services to Customers - Comparison of OLT Curve and BGWC and ORS Proposed Survivor Curves



9. Accounts 1395 Thru 1405 Treatment and Disposal Equipment

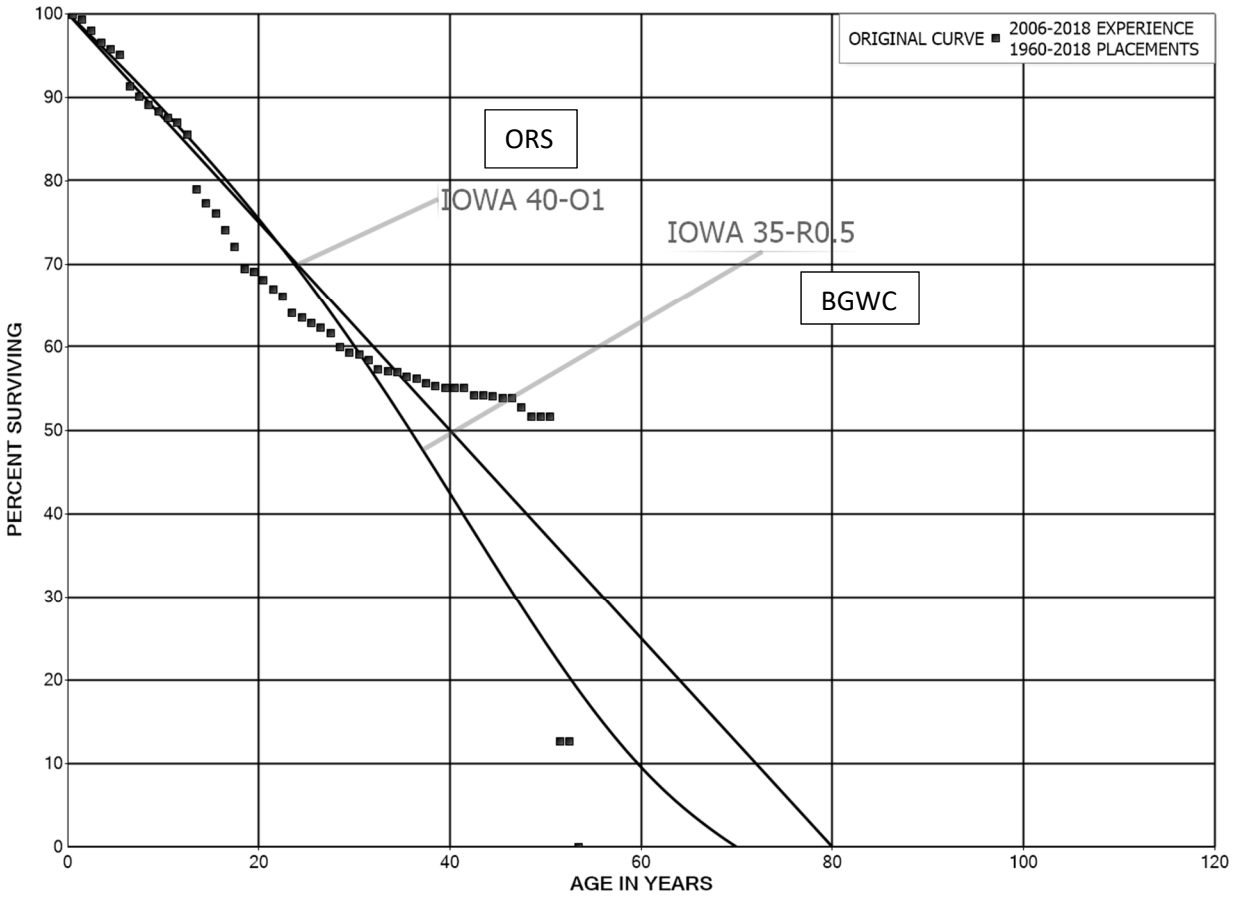
Q. WHAT SERVICE LIFE ESTIMATES DID THE PARTIES PROPOSE FOR THIS ACCOUNT?

A. The company proposes the survivor curve estimate of 35-R0.5 for these accounts. The ORS witness proposes a longer service life again and recommends a 40-O1 survivor curve for these accounts.

Q. DOES ORS WITNESS GARRETT DISCUSS ANY MEANINGFUL REASONS TO MAKE A SERVICE LIFE ADJUSTMENT FOR THIS ACCOUNT?

A. No. Mr. Garrett does not discuss any convincing arguments for diverging from the proposed service life estimate for this account. As can be seen in Figure 9 below both survivor curves are similar fits, with the only difference being that Mr. Garrett's estimate factors in some later more unreliable data points, similar to previously discussed accounts. My recommendation is that the service life estimate proposed by the company be adopted as ORS witness Garrett has not provided any significant arguments to deviate from the proposed estimate.

Figure 9: Account 1395 Thru 1405 Treatment and Disposal Equipment – Comparison of OLT Curve with BGWC and ORS Proposed Survivor Curves



Q. DOES THIS CONCLUDE YOUR REBUTTAL TESTIMONY?

A. Yes.